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Newsletter

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Editorial

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Dear ESRA Colleagues!

When the World Health Organization announced the disease as a pandemic on 11 March, few of us could imagine how disruptive COVID-19 will be for the lives of us all in the year 2020.
WHO, Coronavirus disease (COVID-19) Pandemic, World Health Organization, Geneva, Switzerland, World Health Organization, 2020.
The coronavirus disease COVID-19 is caused by severe acute respiratory syndrome coronavirus 2, SARS-CoV-2.
H. H. Zalzala, Diagnosis of COVID-19: facts and challenges, New Microbes and New Infections, November 2020, Volume 38, Article 100761.
There are several diagnostic methods for COVID-19. Molecular tests for nucleic acid detection are the reference standard for laboratory diagnosis. They are highly sensitive and specific techniques that can be used for diagnosis of acutely infected COVID-19 patients. While reverse transcriptase - polymerase chain reaction is the most commonly used technique, it is relatively expensive, requires sophisticated instruments, qualified technicians and can take longer time to conduct compared to rapid antigen tests.
N. Ravi, D. L. Cortade, E. Ng, S. X. Wang, Diagnostics for SARS-CoV-2 detection: A comprehensive review of the FDA-EUA COVID-19 testing landscape, Biosensors and Bioelectronics, October 2020, Volume 165, Article 112454.
Disease severity and mortality rates are higher in the elderly, overweight, patients with diabetes mellitus, chronic lung and cardiovascular diseases, and people with low vitamin D levels.
M. Chakhtoura, N. Napoli, G. El Hajj Fuleihan, Commentary: Myths and facts on vitamin D amidst the COVID-19 pandemic, Metabolism Clinical and Experimental, 2020, 109, 154276.
It is best to avoid infection and follow advices of health authorities on social distancing and hand hygiene; however, remember there are things you can do yourself to lower the risk of more severe disease progression by maintaining normal healthy weight, exercising regularly, increasing your fruits and vegetables intake and following public health authorities' advice on taking your vitamin D supplements.
The year of COVID-19 is the year where ESRA community meets for the first time in history virtually rather than physically in Venice, as originally scheduled for the ESREL 2020 / PSAM 15 conference, as indicated on the conference website (www.esrel2020-psam15.org).
Stay isolated as much as you can and let us all hope that effective vaccine will become available as soon as possible.

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Feature Articles

Improved computing algorithm to quantify unavailability of maintained multi-component systems

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Introduction - System representation and unavailability computation

Unavailability quantification of a real system can be connected with computational difficulties in practice. Example of a real system to be analysed is shown in Figure 1. The system is demonstrated by means of a directed acyclic graph (AG), [1]. A graph is composed of nodes and edges. The highest node (here u1) represents functionality of the whole system (success, failure), internal and terminal nodes represent subsystems and components. All of the nodes are bounded by edges. Direction of the graph is not explicitly marked in Figure 1 it is given by itself - by projection to vertical direction. The graph is acyclic which means that it cannot contain feedback loops.

Terminal nodes, as for example T1 or T2, of the AG are marked by blue squares. They represent stochastic functionality of input components given by a probability distribution of their time to failure and a maintenance model. From them we can compute a time course of the unavailability function of input components, using methodology of basic renewal theory.

Internal nodes (non-terminal) are marked by blue triangles. They represent functionality of subsystems. A subsystem is well functioning in a given time point (success) just in the case when the number of well-functioning inferior edges reaches at least the number that is inside of the triangle, see Figure 1. Otherwise it is not-functioning (failure). For example, internal node u3 is well-functioning when the number of well-functioning inferior edges is at least 1.

The key problem and objective is to estimate the point (or instantaneous) unavailability at any time *t*, which is the probability that the system is unavailable at time *t* due to a failure or due to an ongoing repair after the detection of a failure. In [2] we developed new procedure for exact reliability quantification of a highly reliable system. The algorithm will be demonstrated on the system from Fig. 1, which is composed of different terminal nodes. The probability of a non-functional state of the system (represented by the u1 node) can be obtained upwards resulting from unavailability functions of independent terminal nodes. For instance, the unavailability of the internal node u7 can be computed as follows:

- numerical expression of the unavailability of inferior terminal nodes, i.e. elements C6, C7 and T7 (having unavailability q_6, q_7 and q_{T7})
- numerical expression of the unavailability q_{u7} of the internal node u7 which is given by the following sum:

$$q_{u7} = q_6.q_7.q_{T7} + (1-q_6).q_7.q_{T7} + q_6.(1-q_7).q_{T7} + q_6.q_7.(1-q_{T7}) + (1-q_6).(1-q_7).q_{T7} + (1-q_6).q_7.(1-q_{T7}) + q_6.(1-q_7).(1-q_{T7}) \quad (1)$$

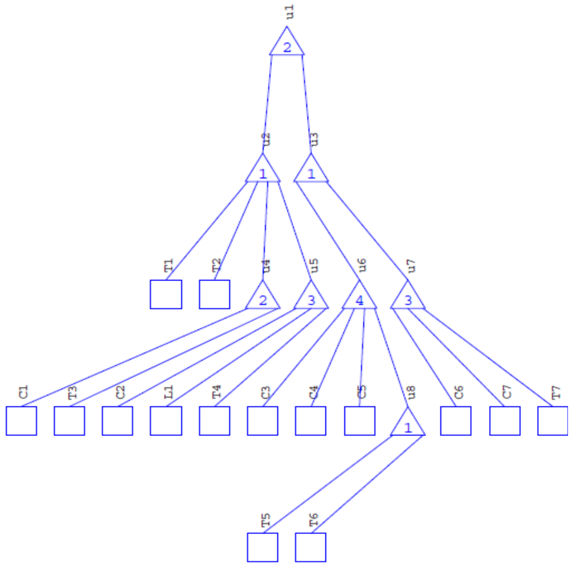


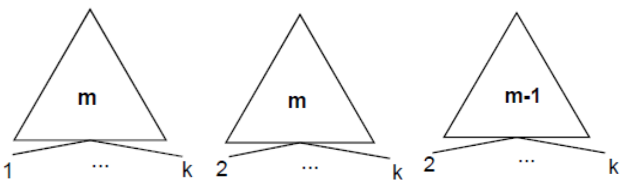
Figure 1. Graph structure of a real system

In other words, we go over all possibilities of non-function state of the node u7 in ascending order of functioning edges. The process is terminated just in the case when the number of well-functioning inferior edges reaches 3 (i.e. the number that is inside of the triangle).

The unavailability of a node of an AG is in fact given by going over all possible combinations of probabilities of the input edges (such combinations that cause failure of the node). If a node has a lot of input edges, we can expect computational difficulties. For example, having 20 input edges we have regularly a million combinations to be summarized what results in an unaccepted excessive long computing time.

Computational improvement:

In Figure 2 we give definitions of following nodes N1-N3, with input edges denoted as 1,2, …k:



Node 1 (N1) Node 2 (N2) Node 3 (N3)

Figure 2: Different kind of nodes

We denote unavailability of j^{th} node as $U(\mathrm{N}j)$ and unavailability of i^{th} input edge as $U(i)$. Obviously we can write:

$$U(\mathrm{N1}) = U(1).U(\mathrm{N2}) + (1- U(1)).\, U(\mathrm{N3}) = U(1).\, [U(\mathrm{N2}) - U(\mathrm{N3})] + U(\mathrm{N3}) \qquad (2)$$

This operation we call as pivotal decomposition (applied to first input edge). Expression in square brackets can be simplified (a lot of elements are eliminated applying subtraction) to the following expression:

$$\sum_{\binom{k-1}{m-1}} \ldots \times U(i) \times \ldots \times \big(1 - U(j)\big) \times \ldots \qquad (3)$$

indexes i are from $\{2,3,\ldots k\}$

↓ number of factors in parentheses is "m-1"

And the last summand in (2) can be simplified by analogy (i.e. recurrently, by the same way as $U(\mathrm{N1})$). In other words, the process of pivotal decomposition can be applied to second input edge, etc. By applying this process recurrently, we obtain an alternative and time saving formula to compute $U(\mathrm{N1})$.

Example: Let us substitute in Figure 2 for m=3 and k=4. Then

$$\begin{aligned} U(\mathrm{N1}) = U(1).\{&(1- U(2)).(1- U(3)).U(4) \\ &+ (1- U(2)).U(3).(1-U(4)) \\ &+ U(2).(1-U(3)).(1-U(4))\} \\ &+ U(2).\{(1-U(3)).U(4) + U(3).(1-U(4))\} \\ &+ U(3).U(4) \end{aligned} \qquad (4)$$

Results with tested system from reference

We consider a system model that is a generalization of the highly reliable Markovian system (HRMS) often used to represent the evolution of multi-component systems in reliability settings, and which has been studied in [3-4], among others. In the HRMS model, the system has c types of component, with n_i identical components of type i. The system works if at least r_i components of each type i work. Each component is either in a failed state or in an operational state. Specifically, we consider a system with 3 types of component, c=3, with n components each. We assume exponential lifetime and repair times with failure rates λ_1=0.01, λ_2=0.015 and λ_3=0.0002, respectively, and repair rates μ=1 for all components to be compared with results in above mentioned reference. There are ample repairmen who work simultaneously on all the failed components. The system breaks down as soon as at least one component type had less than 2 operational units (r=2). The redundancy is the same for all 3 types of component. We realized comparison computations for n=8, 12, 16 and 20.

The concern is to estimate transient measures, such as time dependent system unavailability, including steady state unavailability.

The system is to such extent complex that it would be hardly computed by applying original methodology from [2]. Number of combinations of all input edges each of 3 internal nodes is excessive. If computational improvements are realized, see formulas (2)-(4), all computations can be run in CPU-times less than 1 min. In Figure 3 we can see dependence of system unavailability on time for n= 20, ending in steady state unavailability values.

Advanced simulation methodology, so called RESTART estimators, to compute unavailability of this system was used in [3]. Table 1 brings comparison of our obtained numerical results of steady state unavailability with simulation results from [3], including computing CPU-time.

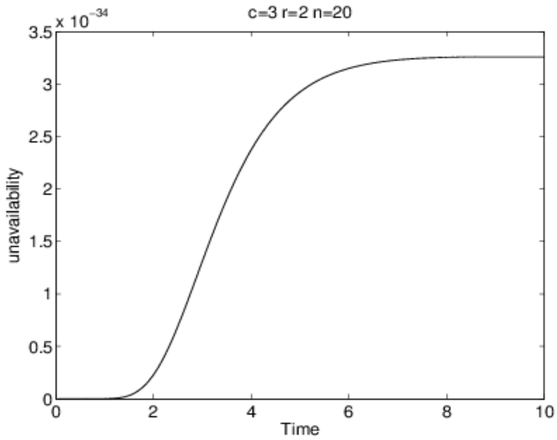


Figure 3. Dependence of system unavailability on time, n=20

Table 1. Steady state unavailability of the referenced system with c=3, r=2 and changing n.

n	Numerical results		Simulation results (with relative error=0.1)	
	U	CPU-time	Û	CPU-time
8	1.284×10^{-12}	<1(min)	1.31×10^{-12}	0.67 (min)
12	**8.74×10^{-20}**	**<1(min)**	**8.76×10^{-20}**	**2.33 (min)**
16	**5.49×10^{-27}**	**<1(min)**	**5.38×10^{-27}**	**3.60 (min)**
20	3.258×10^{-34}	<1(min)	3.19×10^{-34}	9.60 (min)

Conclusions

There was demonstrated on referenced system that the innovative computational method for unavailability quantification is comparable with recent advanced simulation methodology. Even the improved numerical method gives better computational times particularly when $n \geq 12$.

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systems. *Reliability Engineering and System Safety* 130, 115–124.
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Assessing Human performance and Human reliability in novel automation scenarios: upcoming challenges and opportunities webinar series from HRA and HF committee

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The continuous march of technology is increasingly opening new possibilities for the application of automation in domains as diverse as process industry, manufacturing and autonomous driving. All these sectors anticipate huge benefits, in terms of cost, productivity and safety, from the large-scale implementation of advanced automated systems over the coming decade. However, few understand the importance of fully considering how the humans that are supposed to use them should interface with the technology to realise the anticipated benefits and even fewer know how to address this problem. The human factors discipline promotes the consideration of human and organisational factors, particularly in safety critical industries, where breakdowns between the automated system and the human operator can have fatal consequences. However, the methods and approaches used by the discipline face the challenge to keep pace with the development of technology and ensure that new model of socio-technical system performance can be developed so that the human factors can be core to fast technology development. This ambitious aim will require the development of modelling and assessment capacities directly linked with the needs of industry and society to test human machine interface paradigms for safety critical domains as shaped by AI. As stated by Wilson and Daugherty (2018) "Organizations that use machines merely to displace workers through automation will miss the full potential of AI. Tomorrow's leader will instead be those that embrace collaborative intelligence, transforming their operations, their industries and –no less important-their workforces." In Collaborative Intelligent systems, for instance, humans need to perform three crucial roles. They must train machines to perform certain tasks; explain the outcomes of those tasks, especially when the results are counterintuitive or controversial; and they must sustain the responsible use of machines (by, for example, preventing robots from harming humans). On the other side AI can amplify human cognitive strengths such as filter data to provide users with information about the status of a safety critical plant (e.g. distillation column) & suggest possible procedures to cope with plant status upsets. Furthermore, AI systems in collaborative robotics can embody human skills to extend our physical capabilities. In these collaborations the end users should not to be subject to a decision based solely on automated processing and there should always be human oversight. The humans need to be aware that they are interacting with an AI system as both the AI systems and its related human decisions are subject to the principle of explainability, as required by the EU guidelines on ethics in artificial intelligence (2019). The development of Collaborative Intelligence systems requires an interdisciplinary skillset blending expertise in AI with expertise in Human Factors, Human Reliability Analysis, Neuroergonomics and System Safety Engineering. In this coming year the TC for HF and HRA will aim to run webinars and workshop dedicated to explore some of these future challenges and possibilities.

The TC started this focus by participating in ESREL-PSAM 2020 with a PANEL organised by Andreas Bye titled "Human reliability and performance in digital I&C and modern, automated systems" organised on the 4th of November and a special session titled "*HRA Challenges in the Nuclear Industry with Insights for Other Industries*, run on Tuesday 3 November.

We will continue` to discuss these themes and invite more ideas and contribution starting from **The ESRA technical committee on HRA and HF for 2021 will be launching a series of intiative and workshop on the topic of "**Human Performance & Human Reliability Models in New Automation contexts"

The first initiative or 2021 is a webinar to be organised in January, we will then organise doctoral on line workshops on novel topics and applications for this area of research.

To be notified about the initiative please email chiara.leva@tudublin.ie and or luca.podoffilini@psi.ch to be added to the mailing list and or complete this form: https://forms.gle/4fXesXpp6VLnFW436.

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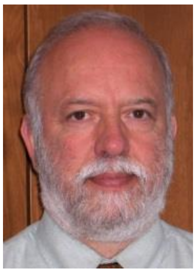
RESS News



Carlos Guedes Soares
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Surrogate models for Uncertainty Quantification

A special (virtual) issue edited by Bruno Sudret from Switzerland and Sankaran Mahedevan from USA, has been published on Surrogate models for Uncertainty Quantification, which includes about 30 papers. The Editors have managed to collect a large number of excellent papers and are congratulated.

The editors describe the scope of the special issue by noting that "structural reliability methods and more generally, methods that aim at taking into account model- and parameters uncertainty have received much attention in the mechanical, civil, and aerospace engineering communities over the past two decades.

Some well-known methods such as FORM/SORM for reliability analysis, spectral methods for stochastic finite element analysis, global sensitivity analysis (Sobol' indices), etc. are nowadays applied in an industrial context, e.g. nuclear, aerospace, and automotive industries, among others.

However, accurate computational models (e.g., finite element analysis) of complex structures or systems are often costly. A single run of the model may last minutes to hours, even on powerful computers. In order to use these models for reliability analysis and reliability-based design optimization, which require repeated calls to the computational code, it is necessary to develop a substitute that may be evaluated thousands to millions of times at low cost: these substitutes are referred to as surrogate models".

Thus the special issue presents the latest methodological developments in surrogate modelling applied to uncertainty quantification, structural reliability, global sensitivity analysis and reliability-based design optimization. The goal is to offer an overview of the most efficient surrogate modelling techniques such as polynomial chaos expansions, Kriging (also known as Gaussian process modelling), support vector regression, neural networks, sparse grid interpolation.

The issue is heavy on papers dealing with kriging such as:

- Real-time high-fidelity reliability updating with equality information using adaptive Kriging
- On confidence intervals for failure probability estimates in Kriging-based reliability analysis
- System reliability analysis by combining structure function and active learning kriging model
- Reliability analysis with stratified importance sampling based on adaptive Kriging
- Adaptive coupling of reduced basis modelling and Kriging based active learning methods for reliability analyses
- Application of adaptive surrogate models in time-variant fatigue reliability assessment of welded joints with surface cracks
- A Two-Level Kriging-Based Approach with Active Learning for Solving Time-Variant Risk Optimization Problems

On sensitivity:

- Efficient dimension reduction and surrogate-based sensitivity analysis for expensive models with high-dimensional outputs
- A framework for global reliability sensitivity analysis in the presence of multi-uncertainty
- Principal component analysis and sparse polynomial chaos expansions for global sensitivity analysis and model calibration: Application to urban drainage simulation
- Variance-based sensitivity analysis for time-dependent processes and importance sampling
- Information Reuse for Importance Sampling in Reliability-Based Design Optimization
- An integrated reliability approach with improved importance sampling for low-cycle fatigue damage prediction of turbine disks
- Structural reliability assessment through surrogate based importance sampling with dimension reduction among several other interesting topics.

The use of more complex models to quantify limit states and failure occurrences leads to very time-consuming models and thus surrogate models appear as a practical tool to substitute the model by one that is more easily handled. Opening a series of questions that have motivated the various papers included in this special issue, which I hope will interest various readers.

ESRA News

The second life of traction batteries as stationary energy storages

Univ.-Prof. Dr.-Ing.
Stefan Bracke
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A new research project has been granted – and by that an important question about the future will be studied

Is a further use of lithium-ion batteries which had been used in electric vehicles in private households possible? How can the batteries be implemented in the private households? These are the questions which will be considered by the scientists of the University of Wuppertal under the direction of Prof. Dr.-Ing. Stefan Bracke (Chair of Reliability Engineering and Risk Analytics) and Prof. Dr. Roland Goertz (Chair of chemical safety and fire defence). The German Federal Environmental Foundation supports the research project with 469.000 Euro.

Once the capacity of lithium-ion batteries has dropped, the batteries are no longer usable in electric vehicles. In the future many traction batteries have to be disposed as the amount of electric vehicles rises. If the battery systems are able to be used for example as stationary energy storages, a decisive contribution to environmental relief will be made. Whether and in what manner the systems can be used in private households will be analysed by the scientists of Wuppertal in collaboration with a consortium of science and industry.

"We will work with an efficient team to answer an important question of the future. What can we do with the old traction batteries from electric vehicles? In consideration of sustainability and resource conservation we will analyse based on the development of a reliability model whether used cells are reliable in a further usage. Therefore, a representative small installation is supposed to be built by our partners from the industry, "Prof. Bracke said.

"At the same time the safety matters significantly," Prof. Goertz added. "In electric vehicles the battery is embedded in a sophisticated safety system. Once the cells are removed from the vehicle and are used in a stationary way for example as energy storage for a photovoltaic system in a private residence, the security structure of the system regarding the fire protection and the environmental protection has to be reconsidered."

Besides the two chairs of the University of Wuppertal, the Hellmann Process Management GmbH & Co. KG from Osnabrück (Germany), BE-Power GmbH from Fernwald (Germany) and Röwer Sicherheits- und Gebäudetechnik GmbH from Osnabrück (Germany) participate as cooperation partners. The research project is supported by HOPPECKE Batterien GmbH & Co. KG from Brilon (Germany).

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AI Factory for enhanced risk management in Railway- AIF/R

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Risk management is highly essential in management of railway assets. The risk management process can be improved by utilisation of digital technologies and AI. The ongoing digitalisation and implementation of AI-technologies in railway is highly dependent on availability and accessibility of data for a geographically distributed system. AIF/R is facilitating this by providing a platform for data sharing. AIF/R is a set of smart cloud/edge-based data services that are aimed to accelerate digitalisation in railway. AIF/R's services provide capabilities such as acquisition, integration, transformation, and processing of railway related data across endpoints, e.g. authorities, industries, academia, and SME:s. AIF/R's integrated services can be invoked on-premises or in multiple cloud-based environments. AIF/R architecture is built on loosely coupled storage and computing services, see Figure 1.

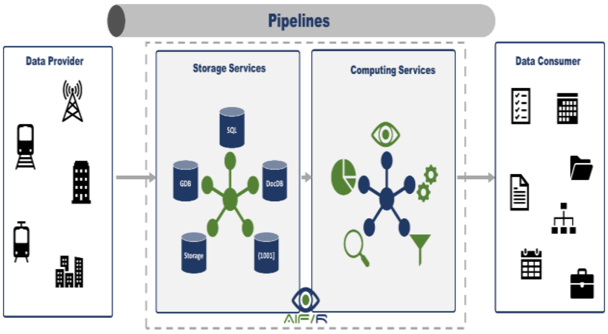

Figure 1. AIF/R's conceptual model

AIF/R provides digital pipelines between data providers and data consumers, as illustrated in Figure 1. Each pipeline represents a set of orchestrated activities aimed to extract, transfer, load, and process datasets between the provider and the consumer. AIF/R's pipelines are configurable entities, which can utilise a palette of technologies for e.g. communication, storage, and processing, to enable context-adaptability and fulfil the users' requirements. Selection of appropriate technologies for each pipeline will be based on the context specific requirements such as requirements on scalability, authentication, and authorisation. It is believed that a generic data factory for railway should be hosted as a neutral open platform which is governed by a body with focus on research and innovation.

PhD Thesis

PhD thesis in "Reliability Analysis of Systems Based on Uncertain Data"

Jan Rabcan

Supervisor:
Prof. Elena Zaitseva
University of Zilina,
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In August 2019, a PhD student, Jan Rabcan, at the University of Zilina in the Slovakia, has successfully defended his PhD thesis, entitled "Reliability analysis of systems based on uncertain data".
The thesis is focused on applying reliability engineering techniques to a system which monitoring produce uncertain data. The research was conducted with long-term goals to propose method for structure function construction based on uncertain data. The construction of structure function is based on classification. At first, one of the classification algorithms typical for data mining can be used. Then, the classifier can be transformed into the decision table. Transformation of the decision table into the structure function is then simple because the definition of a decision table agrees with definition of the structure function.
The data about system behaviour are incompletely specified and uncertain very often. The classification of uncertain data is typical problem in Data Mining. In this case, the structure function is obtained from a classifier, which determines system performance level according to states of the system components. As a classifier, the Fuzzy Decision Tree (FDT) based on cumulative mutual information has been used. Between advantages of this classifier belongs handling of of uncertain and incompletely specified data.
Initial data about system behaviour require pre-processing very often. The addition of this pre-processing is the main novelty of the thesis. The pre-processing is necessary because direct application of FDT is usually not possible. Therefore, a trans-formation for extraction of useful attributes from initial data has to be performed. This transformation is necessary in many cases. For example, if components in a real-world system are sensors, then data is a signal captured in time domain which requires some transformations to prepare data for the next analysis. Due to usage of various transformations in the data preprocessing, the uncertainty of data can arise. This uncertainty can be modeled by fuzzy logic. The advantages of fuzzy logic allow reducing ambiguity and uncertainty of transformed data. Based on data obtained after the preliminary data transformation, FDT can be created and used.

Please read the related publications:

[1] J. Rabcan, V. Levashenko, E. Zaitseva, and O. Chovancova, "Generation of structure function based on ambiguous and incompletely specified data using fuzzy random forest," in Proceedings of 2018 IEEE 9th International Conference on Dependable Systems, Services and Technologies, DESSERT 2018, pp. 418–423, 2018.

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[3] M. Kvassay, P. Rusnak, and J. Rabcan, "Time-Dependent analysis of series-parallel multistate systems using structure Function and markov processes," in Advances in System Reliability Engineering, pp. 131–165, 2019.

[4] J. Rabcan, V. Levashenko, E. Zaitseva, M. Kvassay, and S. Subbotin, "Non-destructive diagnostic of aircraft engine blades by Fuzzy Decision Tree," Eng. Struct., vol. 197, p. 109396, Oct. 2019.

[5] E. Zaitseva, V. Levashenko, J. Rabcan, E. Krsak, "Application of the Structure Function in the Evaluation of the Human Factor in Healthcare," Symmetry, vol.12, 93, 2020.

Maintenance Decision Support of Torrent Protection Structures Subjected to Natural Hazards

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Supervisors:
Prof. Christophe Bérenguer
Dr. Jean-Marc Tacnet

Protection structures in mountains (e.g. torrent check dams) deteriorate when subjected to aging and high intensities natural phenomena. Their efficacy reduction negatively influences the risk level imposed on vulnerable exposed elements located in the downstream area (e.g. people, infrastructures, etc.). This highlights the necessity to regularly inspect and maintain such critical structures. However, limited budgetary resources are available for their maintenance. Innovative decision-support approaches are therefore required to prioritize maintenance strategies. The aim of our research study is to go beyond traditional methods used in natural risks and system's reliability analysis by developing a holistic approach that supports protection structures' decision-making while considering their time-dependent behavior during their lifetime. The developed approach consists in coupling two main models:

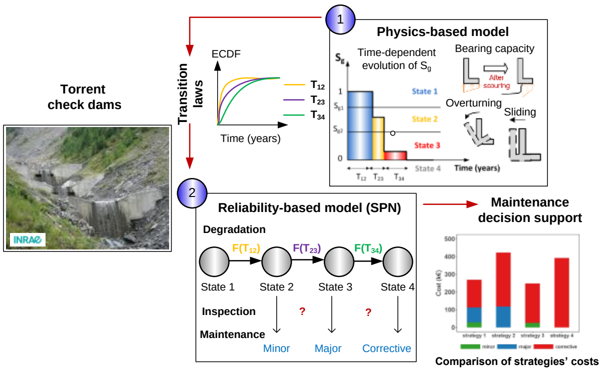
Physics-based dynamic modeling of torrential hydraulics and check dams' stabilities: first, the evolution of the torrent's bed when subjected to randomly generated flood series scenarios is analyzed. This analysis is carried out using a 1-D hydraulic software called LOGICHAR. Then, the dimensions of local scouring under the dams' foundations are estimated after each flood event involved in each scenario. After, the time-dependent evolutions of degradation indicators related to the external stability of the dams (exceedance of bearing capacity, overturning, and sliding) are modeled. These indicators are estimated considering existing interactions between local scouring and the external stability of the dams. Finally, a normalized non-dimensional global stability indicator (S_g) combining the three mentioned external stability indicators is defined and modeled. It allows tracking the dams' deterioration over their lifetime.

Stochastic deterioration and maintenance modeling using physics-informed stochastic Petri nets (SPNs): four different states of the dams (good, poor, very poor and failed) are defined based on specified thresholds of S_g. Depending on the time-dependent evolution of S_g obtained from the physics-based modeling, empirical non-parametric probability laws corresponding to transition times between the defined states are estimated. These laws are finally used in an SPN model that integrates degradation, inspection, and maintenance processes. Monte-Carlo simulation provides stochastic outputs related to (1) the behaviour of the dam when subjected to preventive and/or corrective maintenance operations (time spent by the dam in each state) and (2) the number of maintenance operations (minor, major, and corrective) carried out over the specified period of simulation.

The developed holistic model allows us to assess several maintenance strategies. In this research work, four maintenance strategies are proposed as follows:

1. All maintenance operations are allowed.
2. Minor preventive operations are inhibited.
3. Major preventive operations are inhibited.
4. Only corrective operations are allowed.

The obtained results permit us to compare, sort, and to choose the most convenient maintenance strategy to be applied taking into account the total cost of each strategy. Our research presents a multidisciplinary approach that combines several fields: natural hazards, civil engineering, dependability analysis, and decision sciences. In particular, the proposed approach contributes to the domain of dependability analysis with an indirect physics-based approach to determine transition laws involved in the SPN reliability and maintenance model. However, further work is needed to consider interactions between dams located in series and to quantify the sensitivity of the proposed model outputs to all possible uncertainties.



This research is developed in the framework of the IDEX Risk@Univ. Grenoble Alpes project (https://risk.univ-grenoble-alpes.fr/)

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For more info:
https://www6.ara.inrae.fr/grenoble-etna/RECHERCHE/Projets/CDP-RISK

Calendar of Safety and Reliability Events

18th International Probabilistic Workshop – IPW 2020
Covid-19 Update !!

12-14 May 2021

~~23-25 September, 2020~~

Guimarães, Portugal

The 18th International Probabilistic Workshop (IPW2020) will take place in September 23-25, 2020, at University of Minho, Guimarães, Portugal. This workshop aims at providing an international forum for the debate on topics such as the resilience, robustness and redundancy of infrastructure systems, risk assessment and management, climate change and loading uncertainties, novel decision-making frameworks, and many other topics related to the fundamentals and application of probabilities. The IPW series was founded in 2003 in Dresden, Germany, and since then it was hosted by many other European countries, as Austria, Belgium, the Netherlands, Poland and the United Kingdom. It has been a place to bring together experts on different engineering and science fields, and doctoral students looking for broad knowledge. Expect a very open and friendly atmosphere, perfect for knowledge exchange, discussions and multidisciplinary collaboration.

Conference Co-Chairman:

José C. Matos, University of Minho, Portugal

Paulo B. Lourenço, University of Minho, Portugal

Dirk Proske, Bern University of Applied Sciences, Switzerland

Conference Venue:

Campus de Azurém, University of Minho, Guimarães, Portugal

Further information:

secretariat@ipw2020.com

ESREL 2020 PSAM 15:
Covid-19 Update !!

1-6 November, 2020

Palazzo del Cinema, Venice, Italy

The ESREL2020 PSAM15 Conference will be held in Italy, Venice, in 2020. Through the abstract submission system, opened in October of last year, more than 1400 abstracts have been collected. As a result of the excellent review work by the members of the Technical Program Committee, more than 500 abstracts have been accepted for presentation and an additional 800 have turned into the submission of full papers. The papers accepted will be presented at the conference and included in indexed proceedings.
The program of the Conference is planned to last 5 full days to accommodate plenary lectures, keynotes and some 80-100 parallel technical sessions.
In consideration of the latest developments of the CoViD-19 pandemic, the decision has been taken to postpone the ESREL2020 PSAM15 Conference to November 1-6, 2020, keeping the same venue in beautiful Venice, Italy. The platform for the registration to the conference will be opened in the next weeks.
We continue to count on the support and participation of all the ESRA members and ESREL affiliates, and expect all contributions necessary to make yet another very successful conference in spite of the uncertainty and risk that we are living in, today.
Let us grasp this opportunity of the Conference to exchange and reflect together on what we are doing for the safety of our World and what we are not doing. What is missing?
Prof. Enrico Zio
ESREL 2020 PSAM 15 Conference Chairman
For more information, visit the conference website: www.esrel2020-psam15.org

RAM&PHM 4.0: Advanced methods for Reliability, Availability, Maintainability, Prognostics and Health Management of industrial equipment

The 2021 professional one-week training course: "RAM&PHM 4.0: Advanced methods for Reliability, Availability, Maintainability, Prognostics and Health Management of industrial equipment" will be held ONLINE from 14/1/2021 to 4/2/2021 (each Tuesday and Thursday from 14:30 to 18:30 (Rome time). The course will be the XXIII edition of the series.
The course is stimulated by the evidence that, In recent years, the volume of data and information collected by the industry has been growing exponentially, and more sophisticated and performing analytics have been developed to exploit their content. This offers great opportunities for optimized, safe and reliable productions and products, including optimal predictive maintenance for "zero-defect" production with reduced warehouse costs, and improved system availability, with "zero unexpected shutdowns". To grasp these opportunities, new system analysis capabilities and data analytics skills are needed. The goal of this course is to provide participants with advanced methodological competences, analytical skills and computational tools necessary to effectively operate in the areas of reliability, availability, maintainability, diagnostics and prognostics of modern industrial equipment. The course presents advanced techniques and analytics to improve safety, increase efficiency,

manage equipment aging and obsolescence, set up condition-based and predictive maintenance.
One part of the course is devoted to the presentation of advanced methods for the availability, reliability and maintainability analysis of complex systems and for the development of Prognostics and Health Management (PHM) and Condition-Based Maintenance (CBM) approaches. In this respect, Monte Carlo Simulation, nonlinear regression and filter models (Artificial Neural Networks, Principal Component Analysis, Auto-Associative Kernel Regression, Ensemble Systems, Deep Learning, Convolutional Neural Networks, Reservoir Computing, Particle Filter) are illustrated. In another part of the course, hands-on sessions provide the participants with the opportunity of directly applying the methods to practical case studies. Finally, in the last part of the course, real applications of the advanced methods illustrated in the course are presented. The applications range from the application of Monte Carlo Simulation for system availability analysis and condition-based maintenance management, to the use of regression and classification techniques for fault detection, classification and prognosis in industrial equipment.
The European Safety and Reliability Association (ESRA)) supports the course with two scholarships to be awarded to PhD students. Scholarships will be assigned considering the affinity of the research to the topics of the course, the quality of the CV and the number and impact of publications in the field.
Course program chair:
Prof. Francesco Di Maio,
tel: (+39)02 2399 6372, francesco.dimaio@polimi.it
To register:
https://www.corsoram-phm.energia.polimi.it/

ESRA Information

1. ESRA Membership

National Chapters

- ESRA Norway

Professional Associations

- DBI - The Danish Institute of Fire and Security Technology, Denmark
- ESReDA, France
- IDA Risk – Technical Network for Risk Assessment under the Danish Society of Engineers, Denmark
- KAERI (Korea Atomic Energy Research Institute), Korea
- Machinery Reliability Institute (MRI), USA
- NVRB, The Netherlands
- Polish Safety & Reliability Association, Poland
- SINTEF AS, Norway
- The Safety and Reliability Society, UK
- VDI - Society Product and Process Design, Germany
- VTT, Finland

Companies

- BQR Reliability Engineering Ltd., Israel
- DNV GL, Norway
- Safetec Nordic AS, Norway
- TNO Research, The Netherlands

Educational and Research Institutions

- “Gheorghe Asachi” Technical University of Iasi, Romania
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- Czech Technical University in Prague, Czech Republic
- ETH Zürich, Switzerland
- Federal University of Pernambuco, Brazil
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- University of Ljubljana, Slovenia
- University of Maryland, USA
- University of Natural Resources and Applied Life Sciences, Vienna, Austria

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- University of Southampton, UK
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- University of Strathclyde, UK
- University of the Aegean, Greece
- University of Zilnia, Slovakia
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1.5 Associate Members

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3. Standing Committees

3.1 Conference Standing Committee
Chairman: A. Grall, University of Tech. of Troyes, France
The aim of this committee is to establish the general policy and format for the ESREL Conferences, building on the experience of past conferences, and to support the preparation of ongoing conferences. The members are one leading organiser in each of the ESREL Conferences.

3.2 Publications Standing Committee
Chairman: C. Guedes Soares, Instituto Superior Técnico, Portugal
This committee has the responsibility of interfacing with Publishers for the publication of Conference and Workshop proceedings, of interfacing with Reliability Engineering and System Safety, the ESRA Technical Journal, and of producing the ESRA Newsletter.

4. Technical Committees Methodologies

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ESRA is a non-profit international organization for the advance and application of safety and reliability technology in all areas of human endeavour. It is an "umbrella" organization with a membership consisting of national societies, industrial organizations and higher education institutions. The common interest is safety and reliability.
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For application for membership of ESRA, please contact the general secretary Coen van Gulijk E-mail: c.vangulijk@hud.ac.uk.
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